## IX. *An account of a Micrometer made of Rock Crystal.* *By* G. Dollond, *F. R. S.*

Read January 25, 1821.

Rock crystal having been applied to telescopes in various ways, for the purposes of micrometrical measurements, particularly that which is recommended by M. Arago, induced me to consider if a more simple mode of applying the crystal could not be discovered; and the following account of its application to the eye tube of a telescope, is the result.

The improvement consists in making a sphere or lens from a piece of rock crystal, and adapting it to a telescope in the place of the usual eye-glass; and from its natural double refracting property, rendering it useful as a micrometer.

The advantages of thus applying the crystal are, in the first place, the very great saving of the time required to find the proper angle for cutting the crystal; also of cutting the prisms to their proper angles, and working their surfaces with sufficient accuracy to render them useful as micrometers, in the manner that is recommended by M. Arago, Dr. Wollaston, and others.

Upon the plan which is now submitted, it is only necessary to select a piece of perfect crystal; and without any knowledge of the angle that will give the greatest double refraction, to form the sphere of a proper diameter for the focal length required.

The second advantage is derived from being able to take the angle on each side zero, without reversing the eye tube;

also of taking intermediate angles between zero and the greatest separation of the images, without exchanging any part of the eye tube, it being only required to move the axis in which the sphere is placed.

Thirdly, it possesses the property of an eye tube or lens that is not intended for micrometrical measurements; for when the axis of the crystal is parallel to the axis of the object-glass of the telescope, only one image will be formed, and that will be as distinctly formed as with any lens that does not possess the double refracting property.

The eye tube is so constructed, that the plane through which the two images move, can be placed parallel to the line in the object which is to be measured; and if this motion is furnished with a divided circle, it will correctly answer the purpose of a position micrometer.

The value of the scale is found from the known diameter of any distant object, and will vary in proportion to the magnifying powers of the eye tube; its value increasing in proportion to the increase of those magnifying powers.

The preceding remarks appearing to be sufficient to elucidate the novelty of the application, I shall now endeavour to render the contrivance more explicit by references to the plate. [See Pl. IX.]

Fig. 1. Is a section of the eye tube; and Fig. 2. a general view of the same; both of the full size.

The sphere or lens, *a*, fig. 1. is formed of rock crystal, and placed in half holes, from which is extended the axis *b*, *b*, with an index attached; which index registers the motion of the sphere, the extent of that motion being shown upon the divided face *c*, fig. 2. The sphere is so placed in the half

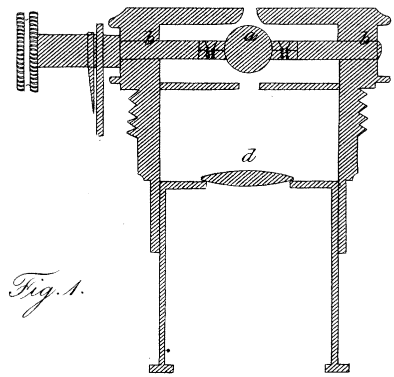


Fig. 1.

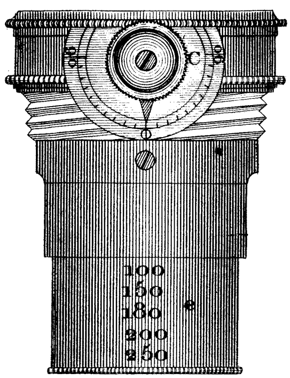


Fig. 2.

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holes, that when its natural axis is parallel to the axis of the telescope, only one image of the object is seen. In the other direction, or that which is at right angles to the axis of motion, it must be so placed, that when it is moved, the separation of the images, viz. the ordinary and extraordinary, may be parallel to that motion. The method of acquiring this adjustment is, by turning the sphere in the half holes parallel to its own axis.

The field of view of the eye tube is increased, and the magnifying power varied, by the introduction of the lens *d*, fig. 1, between the sphere and the primary image of the object-glass; and its distance from the sphere will be in proportion to the magnifying power required; the magnifying powers are engraved upon the eye tube at *e*, fig. 2, and will vary in proportion to the focal length of the object-glass to which the eye tube is applied.

Those marked in the figure, are for an object-glass of 44 inches in focal length.

When I constructed this micrometer, it was my intention to have applied it to the measurement of the angles that are subtended by the apparent diameters of the fixed stars, as seen in achromatic refracting telescopes, for the purpose of determining their relative magnitudes; also of measuring the distances of those double stars that would come within the range of the micrometer; but from being compelled to attend to business of more immediate consequence, I am not able to accompany this description with any measurements that are sufficiently important to be interesting; although I am fully convinced from the trials I have made, that the micrometer is quite equal to the purposes for which it was intended.